



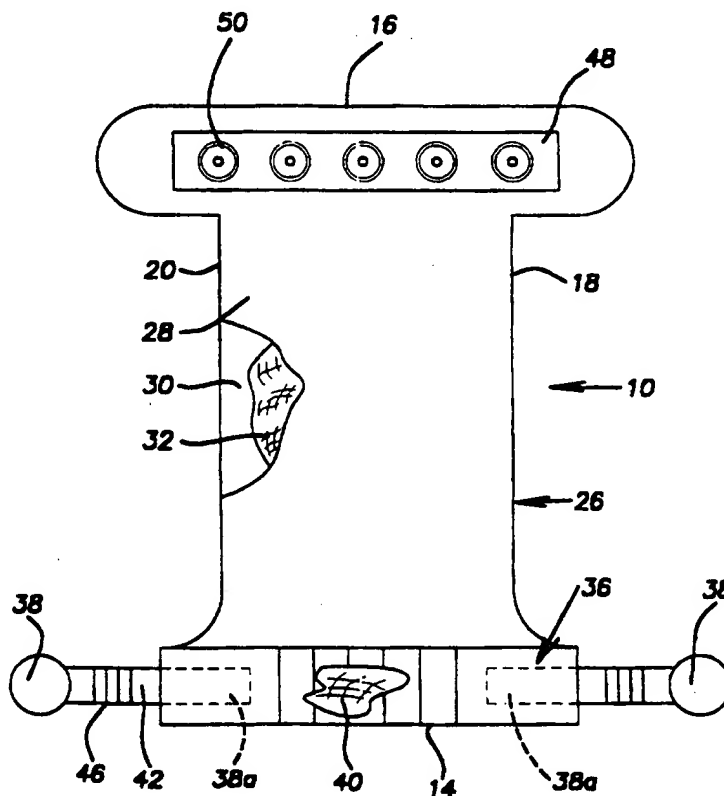
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(54) Title: DISPOSABLE DIAPER WITH WAIST BELT STRUCTURE

(57) Abstract

A disposable diaper (10, 60, 80, 100, 120) includes a laminate (12) extending between first and second diaper ends (14, 16), and includes a waistband (34, 62, 82, 102, 122) adjacent the first diaper end (14) and a fastening system (38, 48, 66, 72, 86, 92, 106, 112, 126, 132) movable between an open and a closed position for releasably securing the diaper to a user. The waistband forms a tubular belt loop (36, 64, 84, 104, 124) extending along the first diaper end (14) to eliminate exposure of the edge or edges of the laminate (12) to the diaper user. The fastening system includes a fastener belt (38, 66, 86, 106, 126) mounted within each end of the waistband loop (36, 64, 84, 104, 124) by a factory joint (38a) whereby the tubular loop also eliminates exposure of the factory joints (380) to the diaper user. Mechanical (44, 44a, 50, 50b, 68, 70), mechanical/adhesive (88, 90, 108, 110, 128, 130) fastening or mechanical/cohesive (88, 90, 108, 110, 128, 130) fastening elements are carried by the fastener belts (58, 66, 86, 106, 126) and a diaper landing zone (48, 72, 92, 112, 132).



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1 DISPOSABLE DIAPER WITH WAIST BELT STRUCTURE

2 This application claims priority of US Provisional
3 Application No. 60/012,347, filed February 27, 1996.

4 BACKGROUND OF THE INVENTION AND RELATED ART

5 The present invention relates to disposable diapers
6 having a fastening system for closing the diaper about
7 the user's body and, more particularly, to a disposable
8 diaper having a complete waist belt structure and more
9 convenient closure systems.

10 Diapers of this type are usually provided with a
11 generally rectangular configuration and a layer
12 construction. A typical diaper comprises an absorbent
13 pad or batt or the like enclosed in a liquid impermeable
14 outer backsheet and a liquid permeable inner top sheet.
15 The backsheet may comprise a plastic film of polyethylene
16 or a non-woven fabric laminated with a water impermeable
17 layer such as a polyethylene film. The top sheet
18 comprises a water permeable fabric or non-woven shell or
19 liner that promotes separation of fluid from the user.
20 The top sheet and the backsheet are sealed together along
21 their overlying longitudinal edges, the opposed end edges
22 being formed by cutting the layers and being unsealed.

23 The fastener tape system generally includes adhesive
24 tabs fastened to one end of the diaper assembly
25 construction at each lateral side of the diaper in a
26 permanent "factory joint" by the diaper manufacturer
27 using adhesives or other techniques. The tabs have a
28 face coated with pressure-sensitive adhesive. The tabs
29 are releasably attachable to the other end of the diaper
30 at each lateral side in a "user joint". The attachment
31 is releasable both to allow permanent removal of the
32 diaper and to allow unfastening to inspect the diaper
33 followed by refastening if indicated.

1 The user joint may be formed by direct connection of
2 the tab to the diaper outer surface or backsheet whether
3 the latter is formed of a plastic film or a non-woven.
4 In the case of plastic films, it is typical to provide a
5 "landing zone" formed of reinforcing tape or the like for
6 receiving the end of the tab to form the user joint. The
7 landing zone may provide a plastic surface or a nonwoven
8 surface and may comprise a knit type fabric landing pad.

9 When the diaper is fitted to a baby, the fastener
10 tabs typically extend from the longitudinal edges
11 adjacent one end of the backsheet to the landing zone or
12 area on the other lateral end of the backsheet that is
13 positioned over the user's or baby's abdomen.
14 Accordingly, the fastener tabs may be readily grasped by
15 the baby and possibly pulled open.

16 The fastener tape system may rely solely upon
17 pressure-sensitive adhesive in the formation of the user
18 joint as shown in US Patents 4,795,456 4,710,190,
19 4,020,842 and 3,833,456. The use of combined adhesive
20 and mechanical fastener systems is shown in US Patents
21 5,019,065, 5,053,028 and 4,869,724. The teachings of all
22 of these patents being incorporated herein by reference.

23 The use of extensible or stretchable tabs to promote
24 user comfort through better fit and more secure mounting
25 is also known in the art. The tabs operate as extensible
26 diaper side waistbands. Examples of such diaper
27 fastening systems are disclosed in US Patents 4,795,456,
28 4,066,081, 4,051,853 and 3,800,796.

29 Related art includes US Patents 2,499,898,
30 2,548,004, 3,038,225, 3,064,268, 3,089,494, 3,454,993,
31 4,189,809, 4,880,421, 5,097,570, 5,119,531, 5,345,659,
32 5,440,787 and 5,545,159.

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The waistband also includes several mechanical closure systems that are more conveniently manipulated than the prior art adhesive fastener tapes or hook/loop type tabs. Also, the relatively larger dimensions of the mechanical engaging elements of the invention substantially reduce, if not eliminate, the prior art problems involving crushing the hooks/loops during manufacture or processing, especially in roll manipulation. Certain of the closures combine both mechanical and adhesive or cohesive engagement to further improve the security of the diaper closure.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view showing a diaper having a waistband in accordance with the invention, the diaper being shown in a flat condition;

Fig. 2 is a schematic fragmentary perspective view showing the waistband of the diaper of Fig. 1 in a configuration if fitted to an infant and having one of the fastener belts engaged and one opened;

Fig. 3 is a fragmentary perspective view on an enlarged scale showing the closure system of the waistband of the diaper of Fig. 1;

Fig. 4 is a perspective view similar to Fig. 2 showing a second embodiment of a waistband in accordance with the invention;

Fig. 5 is fragmentary sectional view on an enlarged scale showing the closure system of the waistband of the diaper of Fig. 4;

Fig. 6 is a perspective view showing a diaper having a waistband in accordance with another embodiment of the invention, the waistband being shown in the open condition;

Fig. 7 is a perspective view similar to Fig. 6 showing the diaper of Fig. 6 with the waistband in a closed position;

Fig. 8 is a fragmentary perspective view on an enlarged scale showing the closure system of the waistband of the diaper of Fig. 6;

Fig. 9 is a perspective view showing a diaper having a waistband in accordance with a further embodiment of the invention, the diaper being shown in a flat condition;

Fig. 10 is a schematic fragmentary perspective view showing the waistband of the diaper of Fig. 9 in a configuration as if fitted to an infant and having one of the fastener belts engaged and one opened;

1 Fig. 11 is a schematic perspective view of an
2 alternative closure for use in the waistband of Fig. 9;

3 Fig. 12 is a schematic fragmentary perspective view
4 showing a diaper having a waistband in accordance with
5 another embodiment of the invention, the diaper being
6 shown in a configuration as if fitted to an infant and
7 having both of the fastener belts opened;

8 Fig. 13 is a schematic perspective view on an
9 enlarged scale of the waistband of the diaper shown in
10 Fig. 12 with the fastener belts engaged; and

11 Fig. 14 is a schematic perspective view showing a
12 roll supply of the faster belt of the waistband of the
13 diaper of Fig. 12.

14 DETAILED DESCRIPTION OF THE DRAWINGS

15 Referring to Fig. 1, a disposable diaper 10
16 comprises a laminate or layered assembly 12. The diaper
17 10 has a generally I-shape configuration including a
18 first end 14 and a second end 16 connected by
19 longitudinally extending edges 18 and 20. The diaper 10
20 includes a back portion 22 and a front portion 24
21 connected by an intermediate portion 26.

22 The diaper 10 has a backsheet 28, a top sheet 30 and
23 an absorbent core or pad 32. The top sheet 28 and
24 backsheet 30 are sealed together along the longitudinal
25 edges 22 and 24 of the diaper.

26 The top sheet 28 may be formed of liquid-permeable,
27 substantially hydrophobic material, such as a spun bonded
28 web of synthetic filaments. The backsheet 30 may be a
29 thin sheet or film of polyolefin material as is well
30 known in the art. The core 26 may comprise a liquid
31 retaining pad of hydrophilic fibers, such as cellulosic
32 fibers commonly referred to as fluff, possibly blended
33 with synthetic polyolefin fibers.

1 The diaper 10 includes a waistband or waistbelt
2 assembly 34 comprising an essentially tubular belt
3 support loop 36 having opposed fastener belts 38 mounted
4 at each open end thereof in a permanent factory joint
5 38a. The loop 36 may be formed by an extension of the
6 backsheet 28 or the top sheet 30 or by a separate strip
7 portion secured to the adjacent edges of the sheets 28
8 and 30. In each such arrangement, the diaper 10 is
9 provided with a closed end 14 that does not expose the
10 infant user to irritating cut edges of plastic or other
11 laminate materials.

12 The loop 36 may include soft filler such as
13 polymeric foam, cellulosic tissue, fibrous padding or
14 other fluffy material to provide further comfort and
15 enhanced sealing against the baby's body. The loop 36 is
16 thereby provided with a filled and pleated appearance
17 adding to the attractiveness of the diaper.

18 The fastener belt 38 includes a mounting portion 42
19 and an engaging portion 44 including snap nubs 44a (Figs.
20 2 and 3). In order to assure sufficient flexibility and
21 extensibility in the belt construction, the mounting
22 portion 42 is shirred with the use of corrugations or
23 flutes 46 formed therein. The corrugations 46 may be
24 formed during the molding or stamping of the belt or in
25 other conventional manners. The belt is formed of a
26 sufficiently strong material to allow tensioning of the
27 waistband. The belt may be formed of conventional diaper
28 construction materials such as polypropylene, polyester,
29 polyethylene and nylon as well as blends and copolymers.

30 A landing zone 48 is permanently mounted to the
31 backsheet 28 of the diaper adjacent the end 16. As shown
32 in Figs. 1-3, the landing zone 48 comprises an array of
33 recesses 50 having openings 50b sized to resiliently and
34 matingly receive the snap nubs 44a on the fastener belt
35 36. The convex and concave surfaces of the engaging

1 portions 44 and 50 are substantially larger than the
2 cross-sectional areas of the snap nubs 44b and openings
3 50b. The landing zone 48 may be formed of a low density
4 polyethylene material having the recesses formed therein
5 by heat stamping.

6 Referring to Fig. 2, the waist belt assembly 34 is
7 shown in a fitted configuration wherein the landing zone
8 48 is disposed between the belts 38 for engagement
9 therewith. The belt 38 at the right side of the diaper
10 10 is shown engaged with one of the recesses 50 and the
11 belt 38 at the left side of the diaper is open for
12 tensioning prior to engagement.

13 Referring to Fig. 4, a diaper 60 of the same general
14 construction as the diaper 10 is provided with a
15 waistband or waist belt assembly 62. The waist belt
16 assembly 62 includes a tubular belt support loop 64 and
17 opposed fastener belts 66. The waist belt assembly 62 is
18 similar to the waist belt assembly 34 in all major
19 respects except for the closure system as described
20 below.

21 The belts 66 are formed of flexible polymeric
22 diaper construction materials and include an array nubs
23 68 adapted to interlock with a similar array of
24 depressions 70 provided in the landing zone member 72.
25 The nubs 68 and depressions 70 are surrounded by
26 substantially flat or planar belt surfaces adapted to be
27 disposed in overlying contiguous engagement when the
28 fastener is closed.

29 Referring to Fig. 5, the nubs 68 are sized to be
30 received with a resilient fit in the depressions 70.
31 Upon engagement, a very strong closure is obtained since
32 a relatively large number of interlocks are formed. The
33 nubs 68 may range in diameter size from 1/32" to 3/8".

1 The belts 66 and landing zone member 68 may be
2 formed of conventional diaper construction materials such
3 as polyethylene, polypropylene, polyester or nylon.
4 These materials may be shaped using conventional molding,
5 extrusion and casting processes.

6 Referring to Fig. 6, a diaper 80 of the same general
7 construction as the diaper 10 is provided with a
8 waistband or waist belt assembly 82. The waist belt
9 assembly 82 includes a tubular belt support loop 84 and
10 opposed fastener belts 86. The belts 86 are shown in an
11 open condition in Fig. 6 and in a closed condition in
12 Fig. 7. The waist belt assembly 82 is similar to the
13 waist belt assembly 34 in all major respects except for
14 the closure system as described below.

15 The belts 86 are formed with a corrugated surface
16 portion 88 adapted to interlock with a similar corrugated
17 surface portion 90 provided by the landing zone 92 as
18 best shown in Fig. 8. The belts 86 and landing zone
19 member 88 may be formed of conventional diaper
20 construction materials such as polyethylene,
21 polypropylene, polyester or nylon. These materials may
22 be shaped using conventional molding, extrusion and
23 casting processes.

24 The interlocked corrugated surface portions 88 and
25 90 provide the equivalent of adhesive shear strength. In
26 order to further enhance the closure strength, the
27 surface portions 88 may be coated with a pressure-
28 sensitive adhesive. The pressure-sensitive adhesive may
29 be acrylic or rubber based pressure-sensitive adhesives.
30 Preferred adhesives include hot melt adhesives such as
31 the adhesives taught in US Patent 3,932,328.
32 Alternatively, both surface portions 88 and 90 may be
33 coated with a cohesive material. Useful cohesives are
34 disclosed in US Patent 5,085,655. The tack strength

1 provided by the adhesive or cohesive materials prevents
2 the closure from unexpectedly opening.

3 Referring to Figs. 9 and 10, a diaper 100 of the
4 same general construction as the diaper 10 is provided
5 with a waistband or waist belt assembly 102. The waist
6 belt assembly 102 includes a tubular belt support loop
7 104 and opposed fastener belts 106. The belt 106 on the
8 right side of the diaper is shown in a closed condition
9 and the left belt 106 is shown in an open condition in
10 Fig. 10. The waist belt assembly 102 is similar to the
11 waist belt assembly 34 in all major respects except for
12 the closure system as described below.

13 The belts 106 are formed with an array of convex
14 protruding members 108 adapted to interlock with a
15 similar array of concave receiving members 110 provided
16 by the landing zone 112 as best shown in Fig. 11. The
17 belts 106 and landing zone member 112 may be formed of
18 conventional diaper construction materials such as
19 polyethylene, polypropylene, polyester or nylon. These
20 materials may be shaped using conventional molding,
21 extrusion and casting processes.

22 The interlocked surfaces of the members 108 and 110
23 provide the equivalent of adhesive shear strength. In
24 order to further assure the closure, the surfaces of the
25 members 108 may be coated with a pressure-sensitive
26 adhesive. The pressure-sensitive adhesive may be acrylic
27 or rubber based pressure-sensitive adhesives. Preferred
28 adhesives include hot melt adhesives such as the
29 adhesives taught in US Patent 3,932,328. Alternatively,
30 the surfaces of both members 108 and 110 may be coated
31 with a cohesive material. Useful cohesives are disclosed
32 in US Patent 5,085,655. The tack strength provided by
33 the adhesive or cohesive materials prevents the closure
34 from unexpectedly opening.

1 The members 108 and 110 are generally ellipsoid in
2 shape and may range in size from 1/8" to 1/2" in diameter
3 along the short diameter, the long diameter being about
4 1" long. Of course, it should be appreciated that the
5 convex and concave members may have a variety of shapes
6 such as spherical, conical or box-like.

7 Referring to Figs. 12, 13 and 14, a diaper 120 of
8 the same general construction as the diaper 10 is
9 provided with a waistband or waist belt assembly 122.
10 The waist belt assembly 122 includes a tubular belt
11 support loop 124 and opposed fastener belts 126. The
12 belts 126 are shown in an open condition in Fig. 12 and
13 in a closed condition in Fig. 13. The waist belt
14 assembly 122 is similar to the waist belt assembly 34 in
15 all major respects except for the closure system as
16 described below.

17 Each of the belts 126 is provided with one or more
18 rigid tab members 128 having a flat configuration and
19 being slightly spaced from the surface of the belt to
20 which it is mounted and has a pivotal type connection to
21 the belt. The tab member 128 has a guitar pick shape
22 including a tapered trailing end. The member 128 is
23 adapted to be received in a slot opening 130 provided by
24 landing zone member 132. As shown, a plurality of slot
25 openings 130 may be provided to allow for size adjustment
26 of the diaper upon closure. The slot openings 130 should
27 be formed of a material sufficiently strong to resist the
28 loads imposed by the member 128.

29 As indicated above, a plurality of members 128 may
30 be provided at spaced locations along the length of the
31 belt 126. The members 128 may range in length, width and
32 thickness from about 1" x 1" x 1/8" to 1/64" x 1/64" x
33 0.001". It is also possible to arrange the members 128
34 in side-by-side relationship on the belt 128. In the
35 later case, smaller sizes must be used.

1 The closure may be further enhanced by the use of a
2 pressure-sensitive adhesive layer 134 which adheres to
3 the landing zone 132 to inhibit disengagement movement of
4 the member 128.

5 Cohesives may also be used if applied to both the
6 belt 126 and the landing zone 132. The above described
7 adhesives and cohesives may be used.

8 It should be evident that this disclosure is by way
9 of example and that various changes may be made by
10 adding, modifying or eliminating details without
11 departing from the fair scope of the teaching contained
12 in this disclosure. The invention is therefore not
13 limited to particular details of this disclosure except
14 to the extent that the following claims are necessarily
15 so limited.

WHAT IS CLAIMED IS:

1 1. A disposable diaper comprising a layered
2 assembly extending between first and second diaper ends
3 connected by opposed longitudinal edges, waist band means
4 adjacent said first diaper end and a fastening system
5 movable between an open and a closed position for
6 releasably securing said diaper to a user, said layered
7 assembly comprising a laminate of generally rectangular
8 laminate members including a liquid permeable top sheet,
9 a liquid impermeable backsheet, and an absorbent pad
10 intermediate the top sheet and backsheet, said laminate
11 members extending to at least one edge adjacent said
12 first diaper end, said waist band means forming a tubular
13 belt loop extending along said first diaper end to
14 eliminate exposure of said at least one edge of said
15 laminate member to said diaper user, said tubular belt
16 having spaced first and second ends respectively
17 positioned adjacent associated ones of said longitudinal
18 edges of said diaper, said fastening system including a
19 fastener belt mounted at each end of the waist band loop,
20 each of said fastener belts extending from a mounting
21 portion within said tubular loop to an engaging portion
22 extending from said tubular loop, said mounting portion
23 being fixed to said diaper by a user joint enclosed
24 within said tubular loop, and said tubular loop thereby
25 also eliminating exposure of said factory joint to said
26 diaper user.

1 2. A diaper as in claim 1, wherein said tubular
2 loop extends from one of said longitudinal edges to the
3 other of said longitudinal edges.

1 3. A diaper as in claim 1, wherein said fastening
2 belt has a length extending laterally between said
3 longitudinal edges and a width extending longitudinally
4 in alignment with said longitudinal edges, said mounting
5 and engaging portions being positioned at spaced
6 locations along the length of said fastening belt, said
7 tubular loop having a flattened shape and a
8 longitudinally extending major opening dimension
9 substantially corresponding in size with the width of
10 said fastening belt.

1 4. A diaper as in claim 3, wherein said tubular
2 loop includes soft filler to further enhance user comfort
3 and sealing against the user's body.

1 5. A diaper as in claim 4, wherein said fastener
2 belts include extensibility means for resiliently
3 fastening said diaper about the user.

1 6. A diaper as in claim 5, wherein said
2 extensibility means include corrugations in said mounting
3 portions of said fastening belts.

1 7. A diaper as in claim 1, wherein said engaging
2 portion includes a first fastening means engageable with
3 a second fastening means carried by a landing zone fixed
4 to said second diaper.

1 8. A diaper as in claim 7, wherein said first
2 fastening means comprises a first mechanical fastening
3 element positioned adjacent said engaging portion of each
4 of said fastening belts, said second fastening means
5 comprises a second mechanical fastening element carried
6 by said landing zone, said first and second fastening
7 elements each including engaging surface means including

8 mating surfaces having contiguous engagement surface
9 portions and mechanically interlocking surface portions,
10 said contiguous engaging surface portions being
11 substantially larger than said mechanically interlocking
12 surface portions.

1 9. A diaper as in claim 7, wherein said first
2 fastening means comprises a first mechanical fastening
3 element positioned adjacent each end of said engaging
4 portion of said fastening belt, said first fastening
5 element including a convex disc-shaped engaging surface
6 having a centrally located and protruding snap nub, said
7 second fastening means comprises a plurality of second
8 mechanical fastening elements carried by said landing
9 zone, said second fastening element including a concave
10 disc-shaped engaging surface having a centrally located
11 aperture for resiliently receiving said snap nub, said
12 convex and concave disc-shaped engaging surfaces being
13 similarly curved to matingly engage as said snap nub is
14 received in said aperture.

1 10. A diaper as in claim 9, wherein said convex and
2 concave disc-shaped engaging surfaces having similarly
3 sized areas, said snap nub and aperture having similarly
4 sized cross-sectional areas, said areas of said convex
5 and concave disc-shaped engaging surfaces being
6 substantially greater than the cross-sectional areas of
7 said snap nub and aperture.

1 11. A diaper as in claim 10, wherein said landing
2 zone includes five concave disc-shaped engaging surfaces
3 spaced along said second end of said diaper.

1 12. A diaper as in claim 11, wherein said tubular
2 loop extends from one of said longitudinal edges to the
3 other of said longitudinal edges, said fastening belt has
4 a length extending laterally between said longitudinal
5 edges and a width extending longitudinally in alignment
6 with said longitudinal edges, said mounting and engaging
7 portions being positioned at spaced locations along the
8 length of said fastening belt, said tubular loop having a
9 flattened shape and a longitudinally extending major
10 opening dimension substantially corresponding in size
11 with the width of said fastening belt.

1 13. A diaper as in claim 7, wherein said first
2 fastening means comprises a first mechanical fastening
3 element positioned adjacent said engaging portion of each
4 of said fastening belts, said first fastening element
5 including a first flat engaging surface having a
6 plurality of projecting snap nubs, said second fastening
7 means comprising a second mechanical fastening element
8 carried by said landing zone, said second fastening
9 element comprising a second flat engaging surface having
10 a plurality of apertures for resiliently receiving said
11 snap nubs, said first and second engaging surfaces being
12 substantially contiguously superposed when to said snap
13 nubs are received in said apertures.

1 14. A diaper as in claim 13, wherein said snap nubs
2 and apertures are each arranged in a similar array, said
3 array of aperture extending along said second end of said
4 diaper.

1 15. A diaper as in claim 13, wherein said snap nubs
2 have diameters in the range of from about 1/32" to about
3 3/8".

1 16. A diaper as in claim 15, wherein said tubular
2 loop extends from one of said longitudinal edges to the
3 other of said longitudinal edges, said fastening belt has
4 a length extending laterally between said longitudinal
5 edges and a width extending longitudinally in alignment
6 with said longitudinal edges, said mounting and engaging
7 portions being positioned at spaced locations along the
8 length of said fastening belt, said tubular loop having a
9 flattened shape and a longitudinally extending major
10 opening dimension substantially corresponding in size
11 with the width of said fastening belt.

1 17. A diaper as in claim 7, wherein said first
2 fastening means comprises a first mechanical fastening
3 element positioned adjacent said engaging portion of each
4 of said fastening belts, said first fastening element
5 including a first corrugated surface having a plurality
6 of alternating first ridges and grooves, said second
7 fastening means comprising a second mechanical fastening
8 element carried by said landing zone, said second
9 fastening element comprising a second corrugated surface
10 having a plurality of alternating second ridges and
11 grooves, said first and second ridges and grooves being
12 similarly sized for mating interengagement in overlying
13 relationship upon closure of said fastening system, and
14 contact securement means disposed along at least one of
15 said first and second corrugated surfaces, said contact
16 securement means providing tack strength and said
17 interengagement of said overlying corrugated surfaces
18 providing shear strength when said fastening system is in
19 said closed position.

1 18. A diaper as in claim 17, wherein said contact
2 securement means comprises a layer of pressure-sensitive
3 adhesive disposed along said second corrugated surface.

1 19. A diaper as in claim 17, wherein said contact
2 securement means comprises a layer of cohesive disposed
3 along each of said corrugated surfaces.

1 20. A diaper as in claim 17, wherein said tubular
2 loop extends from one of said longitudinal edges to the
3 other of said longitudinal edges, said fastening belt has
4 a length extending laterally between said longitudinal
5 edges and a width extending longitudinally in alignment
6 with said longitudinal edges, said mounting and engaging
7 portions being positioned at spaced locations along the
8 length of said fastening belt, said tubular loop having a
9 flattened shape and a longitudinally extending major
10 opening dimension substantially corresponding in size
11 with the width of said fastening belt.

1 21. A diaper as in claim 7, wherein said first
2 fastening means comprises a first mechanical fastening
3 element positioned adjacent said engaging portion of each
4 of said fastening belts, said first fastening element
5 including at least one convex engaging surface, said
6 second fastening means comprises a second mechanical
7 fastening element carried by said landing zone, said
8 second fastening element including a plurality of concave
9 engaging surfaces, said convex and concave engaging
10 surfaces being similarly curved to matingly engage upon
11 closure of said fastening system.

1 22. A diaper as in claim 21, wherein said fastening
2 system also includes contact securement means disposed
3 along at least one of said first and second engaging
4 surfaces, said contact securement means providing tack
5 strength and said mating engagement of said engaging
6 surfaces providing shear strength when said fastening
7 system is in said closed position.

1 23. A diaper as in claim 21, wherein said contact
2 securement means comprises a layer of adhesive disposed
3 along said first engaging surfaces.

1 24. A diaper as in claim 21, wherein said contact
2 securement means comprises a layer of cohesive disposed
3 along each of said engaging surfaces.

1 25. A diaper as in claim 21, wherein said engaging
2 surfaces have an ellipsoid shape, and have a major
3 diameter of about 1" and a minor diameter of from about
4 1/8" to about 1/2".

1 26. A diaper as in claim 21, wherein said tubular
2 loop extends from one of said longitudinal edges to the
3 other of said longitudinal edges, said fastening belt has
4 a length extending laterally between said longitudinal
5 edges and a width extending longitudinally in alignment
6 with said longitudinal edges, said mounting and engaging
7 portions being positioned at spaced locations along the
8 length of said fastening belt, said tubular loop having a
9 flattened shape and a longitudinally extending major
10 opening dimension substantially corresponding in size
11 with the width of said fastening belt.

1 27. A diaper as in claim 7, wherein said first
2 fastening means comprises a first mechanical fastening
3 element positioned adjacent each end of said engaging
4 portion of said fastening belt, said first fastening
5 element including at least rigid flat member pivotally
6 connected to said fastening belt, said second fastening
7 means comprises a second mechanical fastening element
8 carried by said landing zone, said second fastening
9 element including a plurality of openings for receiving
10 said flat members, said flat members being engaged within
11 associated openings when said fastening system is in said
12 closed position.

1 28. A diaper as in claim 27, wherein said fastening
2 system also includes contact securement means disposed
3 either said engaging portions of said fastener belts or
4 said landing zone.

1 29. A diaper as in claim 28, wherein said contact
2 securement means comprises a layer of adhesive disposed
3 along said engaging portions of said fastening belts.

1 30. A diaper as in claim 21, wherein said contact
2 securement means comprises a layer of cohesive disposed
3 along each of said engaging portions of said fastening
4 belts and said landing zone.

1 31. A diaper as in claim 21, wherein said first
2 fastening means comprises a first mechanical fastening
3 element positioned adjacent each end of said engaging
4 portion of said fastening belt, said first fastening
5 element including at least rigid flat member pivotally
6 connected to said fastening belt, said second fastening
7 means comprises a second mechanical fastening element
8 carried by said landing zone, said second fastening

9 element including a plurality of openings for receiving
10 said flat members, said flat members being engaged within
11 associated openings when said fastening system is in said
12 closed position.

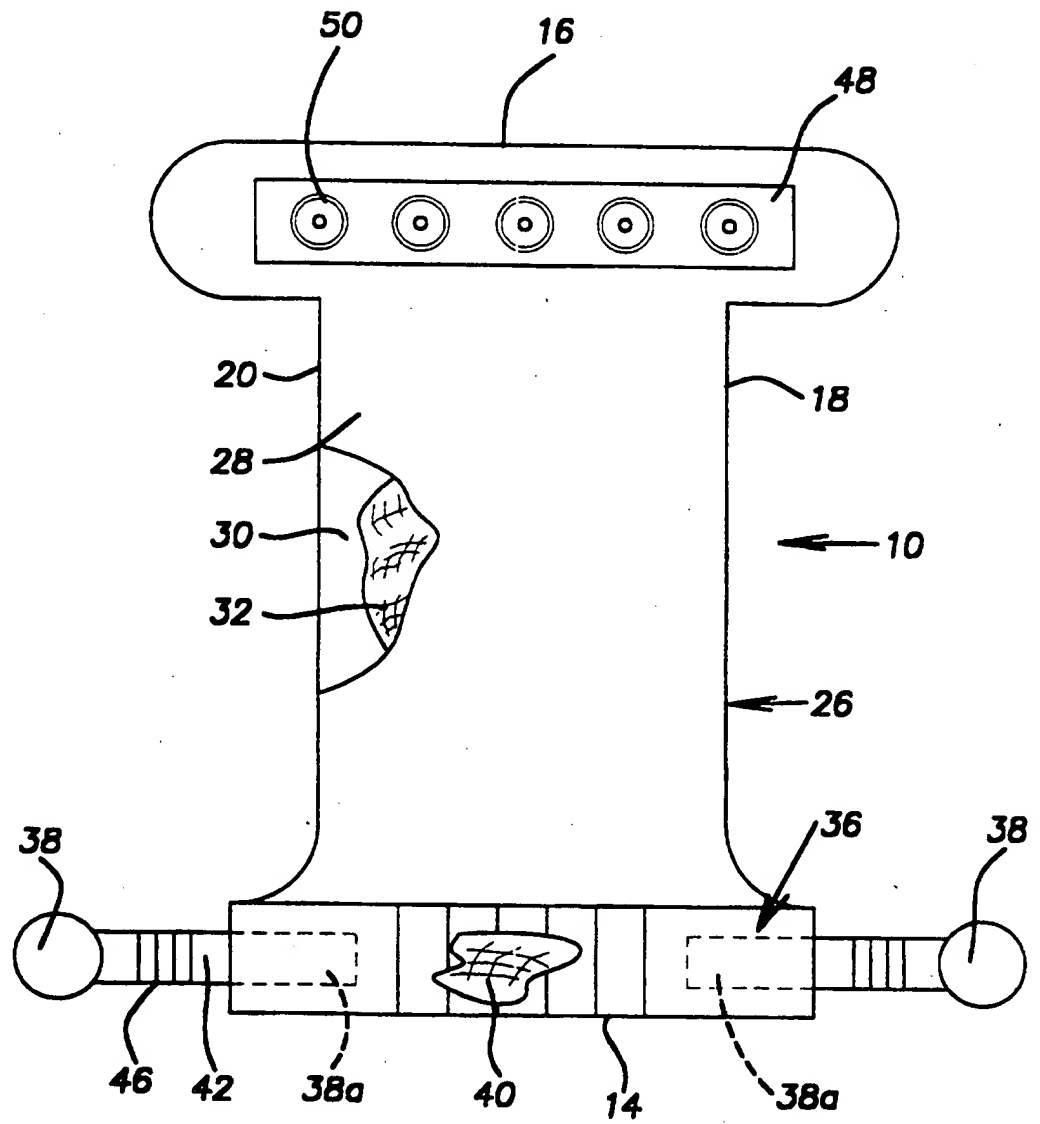


Fig. 1

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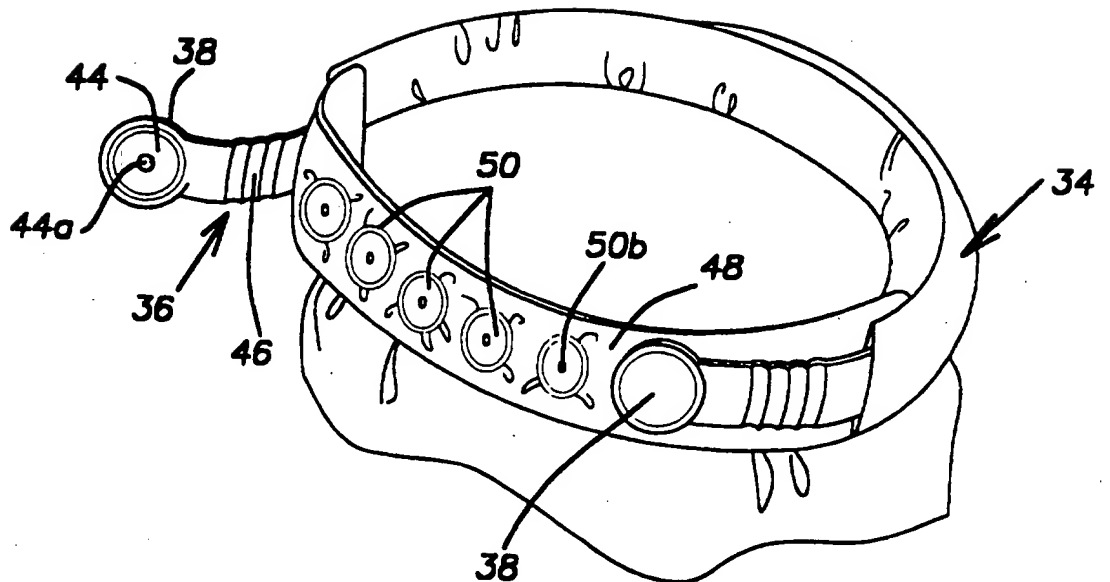


Fig. 2

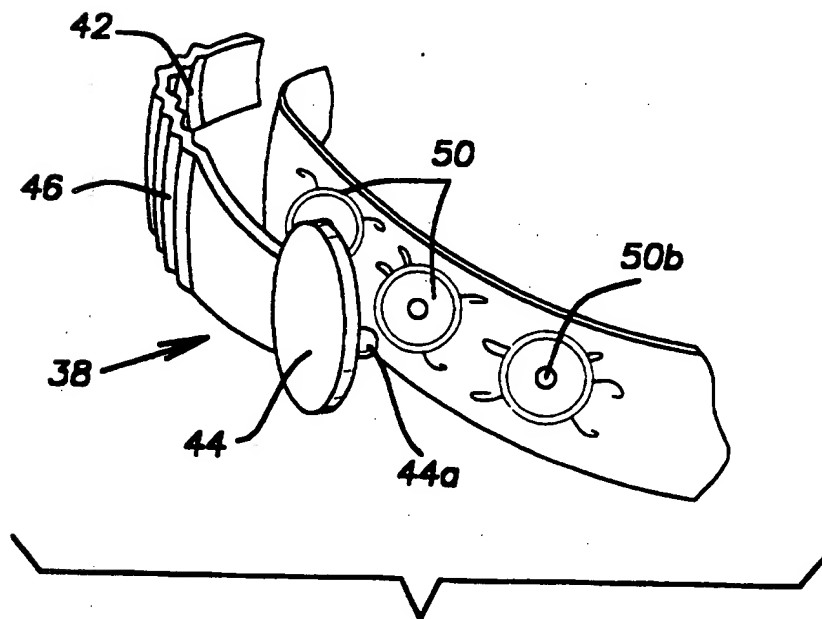


Fig. 3

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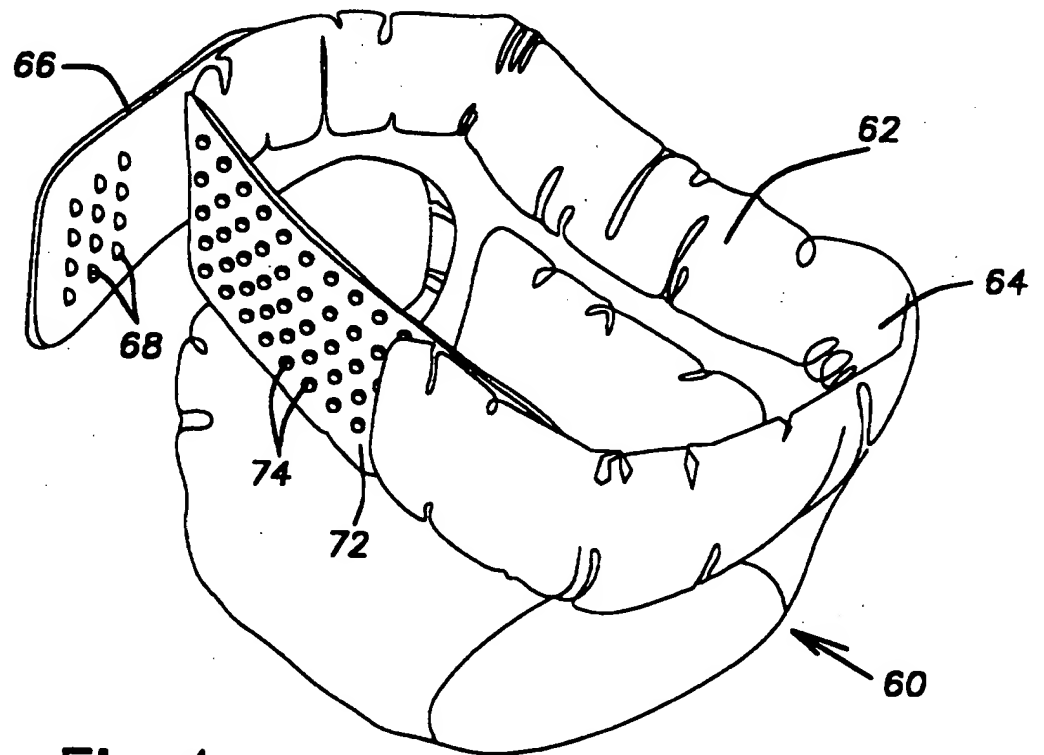


Fig. 4

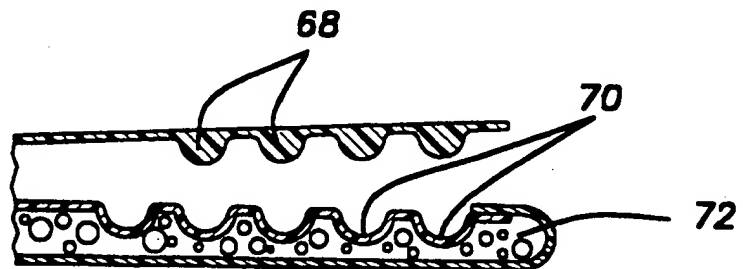


Fig. 5

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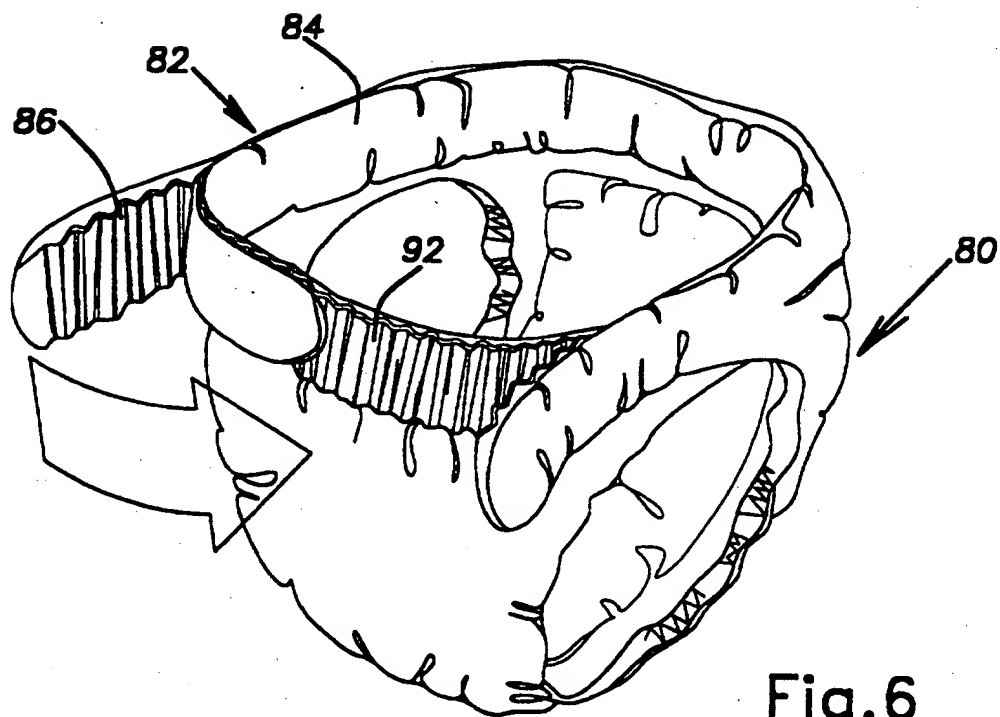


Fig. 6

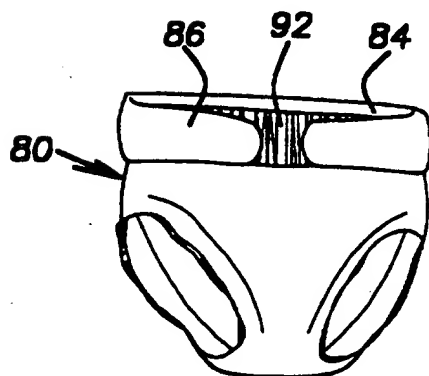


Fig. 7

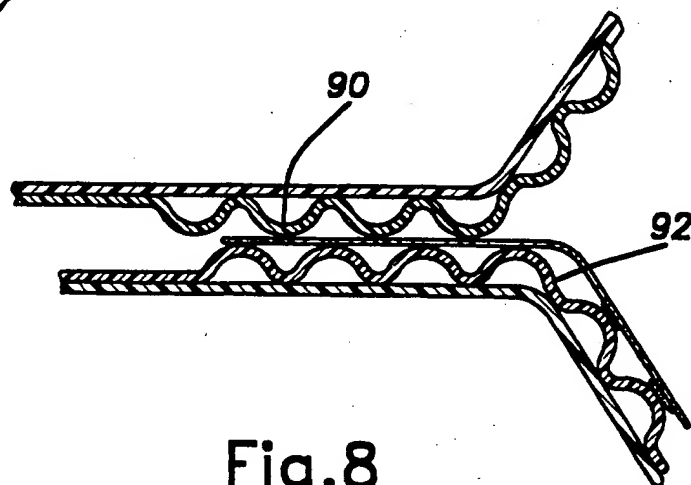
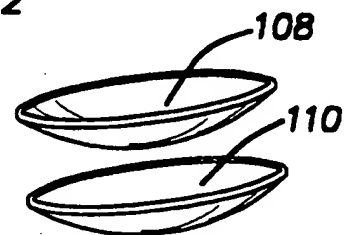
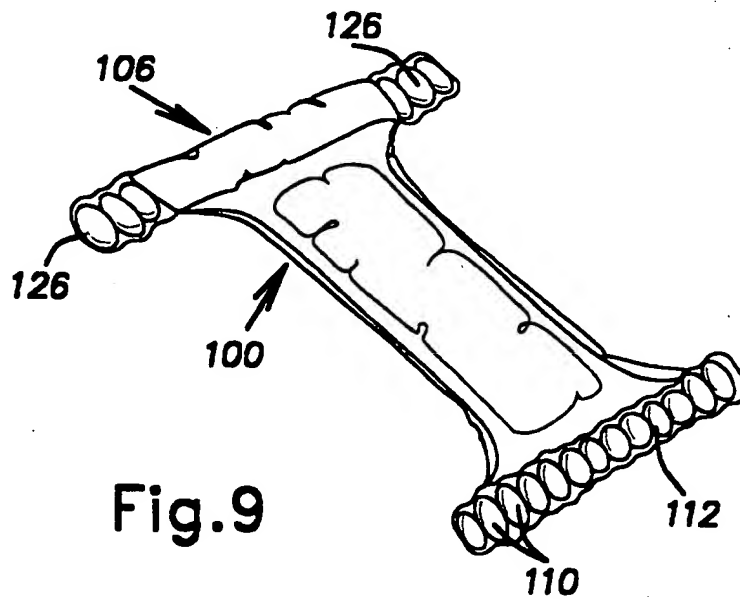
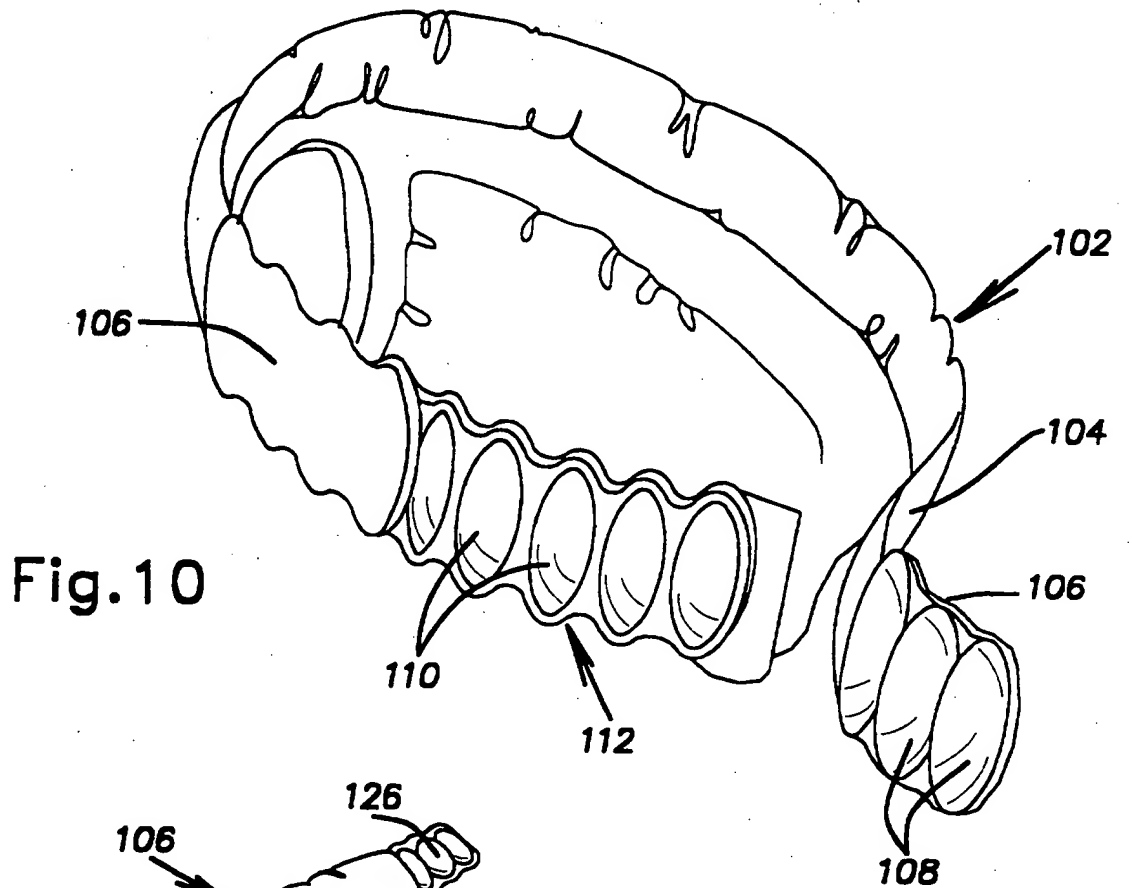


Fig. 8



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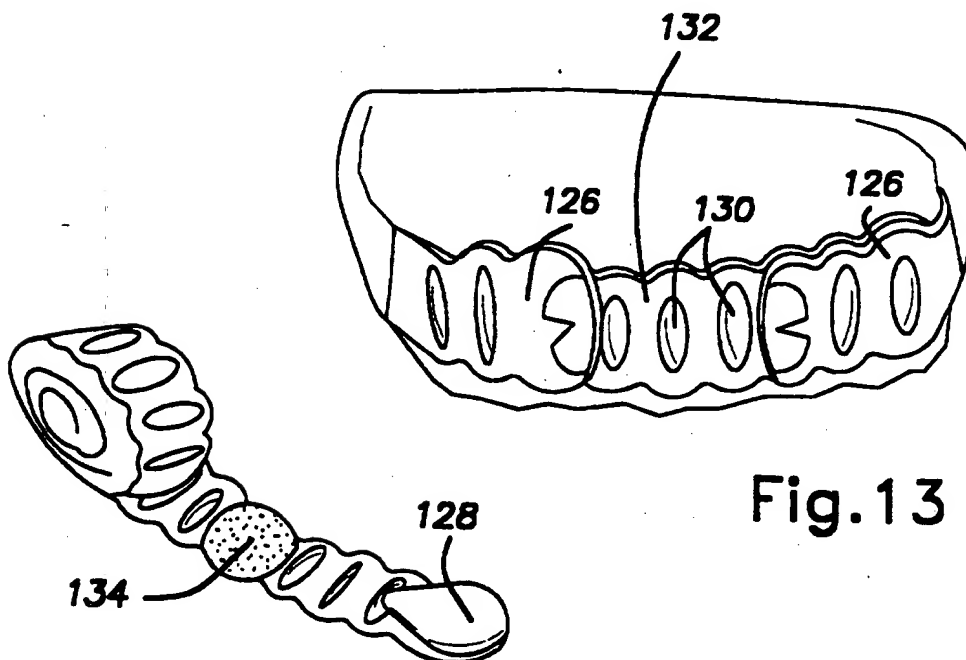
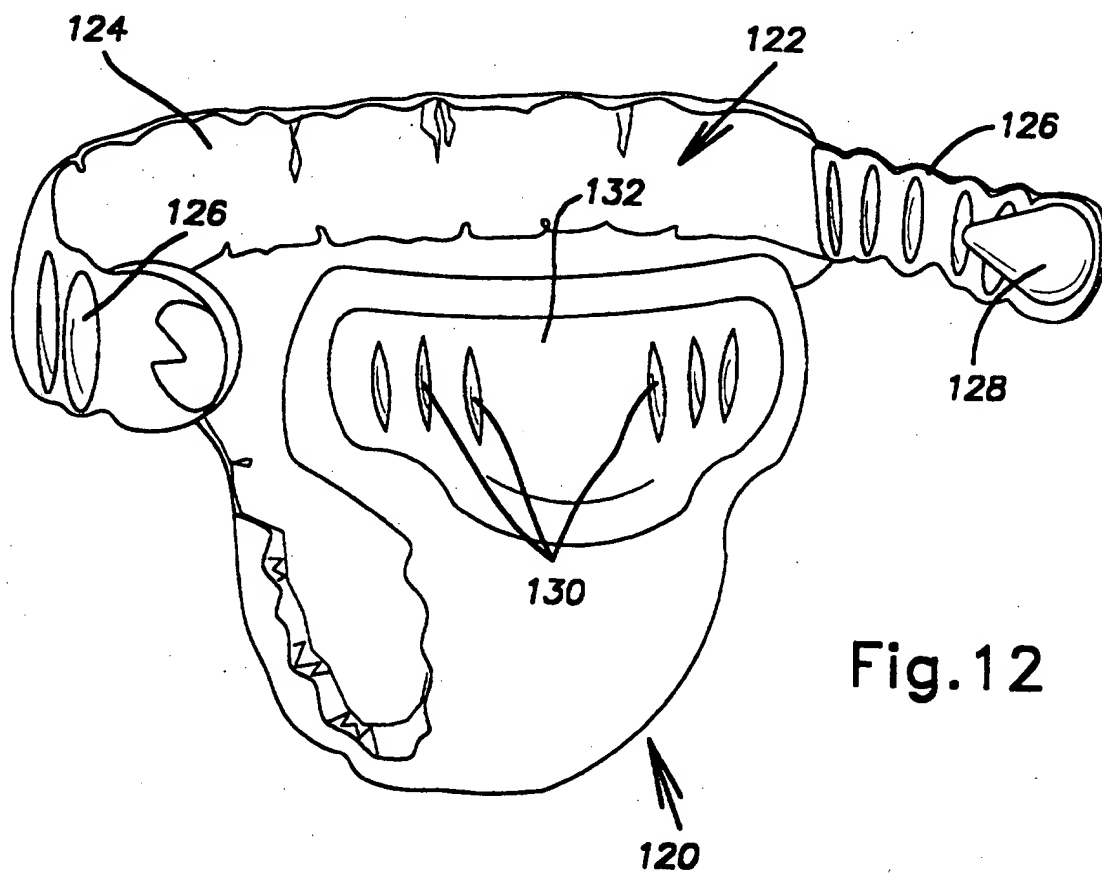


Fig. 14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/03008**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) : A61F 13/15

US CL : 604/385.1, 385.2, 386, 389-392

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 604/385.1, 385.2, 386, 389-393

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4,670,012 A (JOHNSON) 02 June 1987, figures.	1, 5, 6
A	US 5,221,276 A (BATTRELL) 22 June 1993, figures.	1, 7, 13-19, 21-25, 27-30
A	US 5,269,776 A (LANCASTER et al) 14 December 1993, figures.	1-3, 7, 8, 12-31
A	US 2,606,558 A (KENNETTE) 12 August 1952, Fig. 5.	8-11

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	* T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
* A* document defining the general state of the art which is not considered to be of particular relevance	* X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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* L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	* A*	document member of the same patent family
* O* document referring to an oral disclosure, use, exhibition or other means		
* P* document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

15 APRIL 1997

Date of mailing of the international search report

25 APR 1997

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